FORESTS OF CRATER LAKE NATIONAL PARK

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FORESTS OF CRATER LAKE NATIONAL PARK.

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INTRODUCTION.

Among the many natural wonders of the Northwest there are few that produce more profound and lasting impressions than Crater Lake, of southern Oregon. This marvelous body of water lies near the summit of the Cascade Mountains, about 65 miles north of the Oregon-California line, in the heart of one of the most interesting mountainous forest regions of the State.

Briefly, Crater Lake is a deep body of clear, fresh water, contained within the caldera or crater of an extinct volcano. Surrounding the lake, which is about 5 miles in width, the steep cliffs forming the inner slope of the crater rise abruptly to a height of 1,000 to 2,000 feet, and from the rim the outer slopes lead away more gently on all sides. The outer slopes of the crater are generally conceded as being the remains of a lofty peak that once occupied the place where the lake now lies.[1] This mountain, whose outer slopes alone now exist, has been given the name of Mount Mazama.

In the region around Crater Lake there are numerous volcanic peaks, which lift their forest-clad or rocky and barren heads from 7,000 to nearly 9,000 feet above the sea. At their feet break forth a multitude of springs—some gently seeping up through marshy meadows and moss-covered banks, others gushing from rocky founts in veritable torrents. In these springs are born rushing streams that have carved great canyons to the south, east, and west, forming the headwaters of the Klamath and the Rogue Rivers.

Over all of the region, excepting the summits of the highest peaks, is spread a wonderful array of evergreen trees, clothing the slopes with dense, solemn forests, or dotted around mountain meadows, canyons, and crater rim.

[1] For information concerning the geology of this region see the "Geological History of Crater Lake," by J. S. Diller; for sale by Superintendent of Documents, Government Printing Office, Washington, D. C.; price, 10 cents. Also Professional Paper No. 3 of the United States Geological Survey, "The Geology and Petrography of Crater Lake National Park," by J. S. Diller and H. B. Patton.

In order to insure the permanent natural condition of Crater Lake, and its forests, streams, and mountain peaks, the National Government, in 1902, set aside as a national park an area embracing 159,360 acres, in which Crater Lake occupies nearly a central position. To this wonderland hundreds of visitors are attracted every year—geologists, who find a rich field in its craters, canyons, and lava flows; botanists, studying its trees and flowers; but more than all, those who find rest and inspiration in camping or traveling through the wildness of its mountains and forests.

Several good routes are available to those wishing to visit the park. From Medford, Oreg., on the main line of the Southern Pacific Railroad, wagon or automobile may be taken for 82 miles over the Rogue River road, reaching the park at the western entrance. From Ashland, south of Medford, the Dead Indian road leads across the Cascade Divide to Pelican Bay or Upper Klamath Lake, but this road is not a main thoroughfare and does not permit of automobile traffic. A road leads north from Pelican Bay past Fort Klamath, ascending Anna Creek and reaching Crater Lake National Park at the southern entrance. From Klamath Falls, on a branch line of the Southern Pacific, the journey may be made by wagon or automobile to Fort Klamath, or by boat from Klamath Falls to Agency Landing, on Agency Lake, then by automobile or stage to Fort Klamath and to the park. A new wagon road, entering the park on the east side and following Sand Creek, makes Crater Lake readily accessible from Chiloquin, on the Klamath Falls branch of the Southern Pacific Railroad.

Crater Lake National Park is surrounded on three sides by the Crater National Forest, which lies mostly on the summits and upper slopes of the southern Cascade Mountains. Any road that may be taken first passes through the forest before entering the park.

THE FOREST COVER.

Second to the wonderful blue lake in the crater of the former Mount Mazama, the most attractive feature of the park is its heavy mantle of beautiful coniferous forests. Within the confines of the park there are represented more than a dozen cone-bearing species—pines, firs, hemlocks, and others—growing in pure bodies or mingled together, forming a confused, broken cover. The few broad-leaf trees that climb this high in the mountains are mostly small and shrubby, forming an underbrush in the open forests and thickets in the moist ground along the streams.

The various trees of the southern Cascades are not generally scattered throughout the mountains, but are distributed in fairly well defined zones at different altitudes, depending upon the temperature

and amount of moisture they require. East of the Cascade Range the general elevation of the south-central Oregon plateau is between 4,000 and 5,000 feet, and here the climatic conditions are widely dissimilar from those that prevail on the western side, where the surface is several thousand feet lower in the valleys of the Rogue and Umpqua Rivers. For this reason the typical forests on the east and west slopes differ greatly in composition, and from each side merge into a nearly common type of forest on the summit of the range.

Crater Lake National Park, on account of its position, therefore, has mainly the characteristic forest cover of the higher mountains, but within a few hours' ride from any entrance the tree species found are those common in the lower portion of either the eastern or western Oregon region.

At the lowest elevations in the Rogue River Valley and on the Klamath side the forests are composed of species that endure warm summer temperature and thrive in the dry and powdery soil. Here the predominating tree is western yellow pine, which on the west slope occurs mainly with scrubby oaks, madrona, and small Douglas fir. On the Klamath side, where the general elevation is higher, yellow pine is very abundant and forms magnificent forests either alone or associated with Douglas fir, white fir, lodgepole pine, sugar pine, and incense cedar.

As one ascends the west side the composition of the open yellow-pine forest changes at middle elevations to more dense stands, in which Douglas fir is the most abundant tree. Here also are other species, such as western hemlock, western red cedar, white fir, and lodgepole and sugar pine, that prefer the cooler and more moist situations.

By the time the park is reached many of these trees become fewer in number, and their place is taken by trees of the higher altitudes. The dense forests around the edges of the park and on the lower slopes of the former Mount Mazama have a large number of species, among them several of the true firs, Douglas fir, lodgepole pine, Engelmann spruce, mountain hemlock, and western white pine.

Climbing still higher, to the very rim of Crater Lake, and up the slopes of the surrounding peaks, the forest becomes more scattered and the trees smaller and more stunted. Only a few species endure the low temperature, high winds, and deep snows at these altitudes, the principal ones being alpine fir, mountain hemlock, and white-bark pine.

Very often scattered trees are found far above or below the general limits of their range. Alpine species descend cool, moist canyons far down into the drier yellow-pine region, and the trees of the lower

country occasionally reach far up into warm favorable areas at the higher altitudes.

No matter which route may be taken to reach the park, this gradual change from one forest type to another is very evident, and this transition offers much to excite the curiosity and interest of the observer.

DESCRIPTIONS OF SPECIES.

WESTERN YELLOW PINE (PINUS PONDEROSA).[1]

In the first forests that are encountered bordering the various roads leading to Crater Lake the attention of the traveler is claimed by noble trees with cylindrical, yellowish-brown trunks and rounded or spire-shaped heads, dotted throughout brush-covered areas, or stretching in open bodies over the hills and higher slopes. This tree is western yellow pine (*Pinus ponderosa*), a species that is at home throughout much of the southern and eastern Oregon region (figs. 1, 2, and 3).

Western yellow pine in old age forms a magnificent straight, stout, round trunk, and carries its heavy limbs far out from the body, forming a cylindrical or flat-topped crown. On large trees the bark usually is not over 2 inches in thickness and is broken up into large plates by deep, narrow furrows. The surface of the bark is composed of small irregular scales, whose yellowish-brown color gives to the trunks of forest-grown trees their soft, warm tone. Younger trees have thicker, dark-brown bark that is divided into rounded ridges, and the crowns as a rule are more conical and pointed.

This species is a three-needle pine; that is, its long, flexible needles are bound in clusters of three, which are thickly disposed in tufts near the ends of the twigs. Yellow-pine cones are oval, from 3 to 5 inches in length, and usually occur in small clusters at the ends of the branches. Two years are required for their development, and during the second autumn the prickly cone scales spread widely, liberating the seeds, shortly after which they fall to the ground. The soft carpet of needles beneath old yellow pines usually is thickly studded with the rich chestnut-brown cones. As a rule yellow pine does not begin to produce seed until the trees are 40 or 50 years old, and after this age quantities of seed are produced only every two or three years.

Yellow pine is one of the most widely distributed trees of North America. From the Black Hills of the Dakotas its range reaches westward nearly to the Pacific Ocean, and, braving the rigors of the climate of southern British Columbia, it extends southward through

[1] This species is known as yellow pine in Glacier and Yellowstone National Parks.

the coast States and Rocky Mountain region to the hot and arid mesas of Lower California and Mexico. Usually it prefers regions where the summers are warm and dry, and it will take hold and do well on any except wet soils.

FIG. 1.—Western yellow pine (*Pinus ponderosa*).

Throughout much of its range this tree is highly prized by the lumberman on account of the excellent quality of timber its straight, clear trunks produce. In eastern Oregon it is by far the most important timber tree, and this also is true throughout much of California

and in many portions of the Southwest. In 1911 western yellow pine ranked sixth in the lumber production of the United States.

FIG. 2.—Western yellow pine (*Pinus ponderosa*) 70 inches in diameter.

Barring accidents in the form of damage from forest fires, insect attacks, and fungous diseases, a yellow pine may reach a mature age

of 400 to 500 years, attaining a diameter of 30 to 40 inches and a height of 100 to 150 feet. The average mature tree in the Fort

FIG. 3.—Western yellow pine (*Pinus ponderosa*).

Klamath region is about 36 inches in diameter and 120 feet in height. The age of such trees usually is between 350 and 400 years, and on the

average they contain about 2,500 feet board measure of merchantable timber. Tall trees, having a diameter of 4 to 5 feet, when felled and converted into lumber, may produce from 6,000 to 7,000 feet board measure, or enough to build a modern frame house of good size.

Along the Anna Creek Road yellow pine forms a considerable part of the magnificent forest up to an elevation of about 5,000 feet, but beyond this elevation it is replaced by other species that thrive better in the more moist soil and humid atmosphere of the higher country. Most of the park lies above 5,000 feet, thus excluding yellow pine, except in a narrow strip along the southern edge that ends shortly above the south entrance. Approaching the park from the west side, the traveler will see an abundance of fine yellow-pine timber from the foothills near Medford to the upper part of the Rogue River drainage.

SUGAR PINE (PINUS LAMBERTIANA).

Yellow pine can not, however, have the claim of being the largest and most kingly pine of the Northwest. This distinction belongs to one of its associates, the sugar pine (*Pinus lambertiana*) of Oregon and California. Around Crater Lake National Park this tree occurs mainly on the lower mountains on the Fort Klamath side, and also on the west slope in the Rogue River drainage extends up to an altitude of about 4,000 feet. It is found only in the extreme southern portion of the park as a rule, extending slightly higher than the yellow pine.

Sugar pine (figs. 4 and 5) seen and recognized once never is forgotten. Forest-grown trees, with their massive, slightly tapering bodies, their open crowns of long, huge branches standing out at right angles from the trunks, and, above all, the clusters of huge cones suspended gracefully from the upturned branch tips, give to this species an individuality that none of its associates possess.

The trunks of young sugar pines taper rather rapidly and they are partly clothed with small branches. In their later years the bodies fill out, forming smooth, slightly tapering columns, and all branches are lost except those on the upper part of the tree. On trees of medium and large size the bark is thick, deeply broken up into furrows, and plates covered by reddish and cinnamon-brown scales.

The slender needles of sugar pine are from 2½ to 4 inches in length and are deep blue-green in color with a tinge of gray. They are bound in clusters of five, a characteristic of the true white-pine group to which this tree belongs. The huge cones hang on the branch tips for two years before the seeds are liberated, and then fall during the third spring and summer. Usually their length is from 12 to 20

FIG. 4.—Sugar pine (*Pinus lambertiana*) 61 inches in diameter.

FIG. 5.—Sugar pine (*Pinus lambertiana*) and cone; tree 6 feet in diameter.

inches, and when their smooth brown scales are fully expanded they are from 4 to 6 inches in diameter.

Sugar pine is found only in Oregon, California, and Lower California, on both sides of the Cascades, from middle Oregon south, mainly along the Cascade Mountains and Sierra Nevada, and also, but to a less extent, in the Coast Range. Nowhere does it form pure forests, but always associates with other species, such as yellow pine, white fir, incense cedar, and Douglas fir.

The wood of sugar pine is soft, pale brown in color, and is greatly valued in the lumber industry. It ranks twenty-fourth in the lumber production of the United States, and California produces nearly 98 per cent of the amount cut.

The largest trees occasionally are from 4 to 7 feet in diameter, and lift their topmost twigs nearly 200 feet from the ground. In and around the park the usual size of the mature trees at 200 or 300 years of age is about 3 feet in diameter and 150 feet in height. A tree of these dimensions will scale about 2,000 feet or more, board measure.

Little wonder it is that the cupidity of the lumberman has led to a rapid exploitation of this noble tree. While it is inevitable that it should be largely cut, on account of the great value of the wood, let us hope that many of the largest monarchs may be preserved to add dignity to the future forests of the two States within which it occurs.

There are fine groups of sugar pine at many points along the road from Medford to the park. One tree especially that may be seen about 8 miles north of Prospect is nearly 8 feet in diameter and contains 25,000 feet, board measure, of timber. In ascending Anna Creek, the traveler who does not leave the road will fail to see the finest sugar pines. It is well worth while to wander out into the forest away from the stream, and there find the tree at its best, towering among the yellow pines and firs and scattering its great cones among the ceanothus and chinquapin brush at its feet.

DOUGLAS FIR (PSEUDOTSUGA TAXIFOLIA).

Another very abundant tree at middle elevations, on both the east and west sides, is Douglas fir. (Figs. 6, 7, and 8.) This tree occurs commonly in the yellow-pine forests bordering the Anna Creek road, but does not extend far beyond the southern entrance of the park. It is more abundant on the west slopes, reaching an altitude of 6,000 feet and over.

The Douglas fir (*Pseudotsuga taxifolia*) is known to the lumberman under many names, such as red fir, yellow fir, Douglas spruce, Washington fir, and Oregon pine. Distributed throughout western

North America, from the Pacific coast to the Rocky Mountains, and from far north in British Columbia to Mexico, it is a hardy tree that must adapt itself to many and varied climatic and soil conditions. It is this tree that in a large part forms the dark and humid forest of western Oregon, Washington, and British Columbia, where its tall spires rival in height all other American trees save the sequoias of California. In the moist forest of the Puget Sound region, monster trees, over 250 feet in height and 8 to 10 feet through, occasionally are found.

In drier regions the trees are much smaller, usually not over 3 feet in diameter and 100 feet in height. The trunks of trees in the higher

FIG. 6.—Douglas fir (*Pseudotsuga taxifolia*).

regions of the Cascades and in eastern Oregon, taper rather rapidly, and except during their early years are free of branches for one-half or more of their length. The corky bark on these trunks usually is broken up into rough furrows and ridges and is dark brown to light brown in color. The tops of young trees are conical and rather pointed, but on old trees the large limbs, with their long, drooping branches, form rather open and airy crowns.

Douglas-fir needles are about 1 inch long, and are scattered singly on all sides of the twigs, forming soft sprays of blue-green foliage. Nearly every years some seed is produced, but it is only every three or four years that the seed is abundant. Then the branchlets and

twigs bear great quantities of small, russet-brown, pendant cones, that open and scatter their small seeds late in the summer. No other tree in the region has cones like those of Douglas fir, and they may be recognized at once by their thin crinkled scales and the long three-pointed bracts that project out over each. The cones are pointed at both ends, and have an average length of $2\frac{1}{2}$ inches.

Douglas fir is the most important timber tree of North America, and to-day it ranks second in the lumber production of this country.

FIG. 7.—Douglas fir (*Pseudotsuga taxifolia*).

There is estimated to be more Douglas fir timber yet waiting for the ax of the lumberman than of any other American species. Washington leads in the production of Douglas fir lumber, and Oregon is second. Its wood is light, soft, and strong; from some trees reddish and coarse grained and from others light yellow and as fine-grained as pine. All together it is an admirable and mighty tree, a species that has been the foundation of the lumber industry in the Northwest.

LODGEPOLE PINE (PINUS CONTORTA).

There is one tree in particular whose occurrence in the park is nearly general, except upon the highest peaks. This is the lodgepole pine (*Pinus contorta*) that, in various regions, is known under the

FIG. 8.—Douglas fir (*Pseudotsuga taxifolia*).

name of black pine, scrub pine, tamarack, and jack pine. This wanderer is equally at home from the glaciers of Alaska to southern California and from the sand dunes of the Pacific to the Rocky Mountains.

In central and southern Oregon vast stands of pure lodgepole pine occur, covering high sandy plateaus and steep mountain slopes alike with a thick forest of small poles. In other places it creeps in among its larger brethren, the sugar pine, yellow pine, and fir, and is content in forming an under story beneath their taller crowns.

Lodgepole (fig. 9) is the only Pacific coast pine that invariably bears its needles in clusters of two. The harsh, slightly curved needles are about 2 inches long, bright yellow-green, and thickly clothe the outer portion of the slender twigs. The small prickly cones are wonderfully persistent, and often cling to the branches for many years without liberating their tiny seeds. Sixty feet is an average height for this tree, and it rarely exceeds a diameter of 20 inches. In dense forests the slender trunks, clothed with reddish-brown checked bark, carry open, rounded, or slender cylindrical crowns.

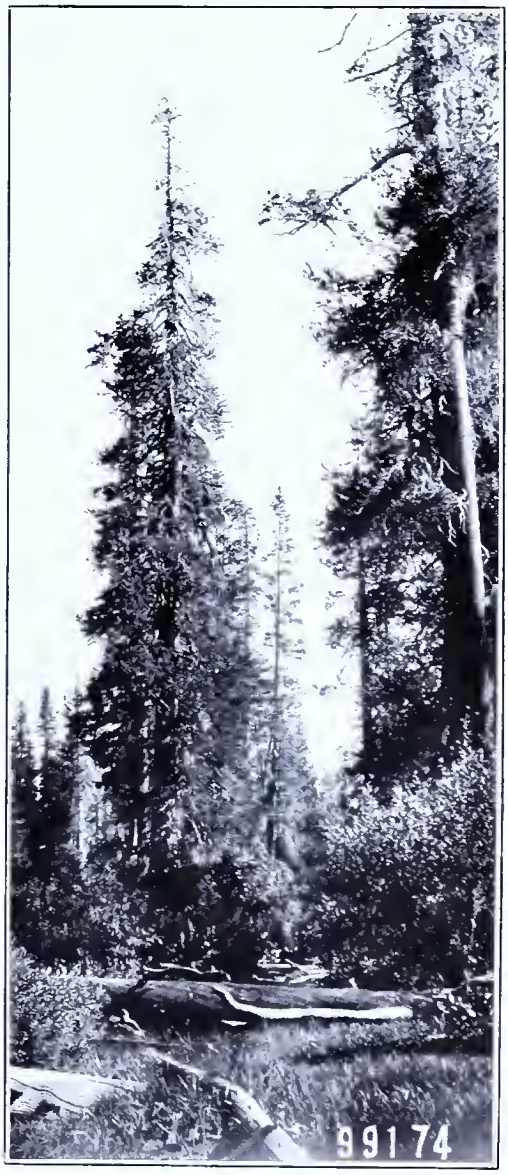

FIG. 9.—Lodgepole pine (*Pinus contorta*) 60 inches in diameter.

Dense stands of lodgepole pine are sadly ravaged by bark beetles and fire, against which their thin bark offers little protection. The timber over thousands of acres has been killed by these causes, but owing to the great vitality of the seed and the fact that much of it is liberated after the trees are dead, the stand is soon replaced by a dense growth of seedlings. It also has replaced other species over immense areas denuded by early fires.

Lodgepole pine does not yet claim much attention in the lumber industry, as only about 1 per cent of the total lumber cut is made up of this timber. The long clean trunks produced in dense stands are

growing in favor for posts, poles, and ties, and the species is particularly valuable for watershed protection in many dry regions unfavorable for other trees.

From Fort Klamath to Crater Lake lodgepole pine will be seen in abundance, at some places in dense pole thickets, but more often mixed among other species. Lodgepole pine is one of the trees in the forest background that sets off to such advantage the carved walls and pillars of the wonderful Anna Creek Canyon. Within the park and below the western entrance persistent growths of this tree climb from the lower moraine-littered slopes up to the very rim of the crater. Wherever it occurs it is much the same cheerful, hardy tree, adapting itself to dry pumice sands and wet marsh borders alike, and doing more than its share in forming the forest cover over vast areas in the higher mountain regions.

WHITE FIR (ABIES CONCOLOR).

Conspicuous in the higher forests of southern Oregon are a number of the true firs belonging to the genus *Abies*, which includes also the well-known balsam fir of the East. Douglas fir should not be confused with the true firs, as it is a widely different tree to which the name fir has become attached by popular usage. All of the true firs are fine handsome trees, many of them large in size and producing excellent timber, others smaller and limby and found only at higher altitudes. Eight species occur naturally in the Pacific coast forests, and of these at least four occur in or near the Crater Lake National Park.

Towering among the Douglas fir and pines south of the park, is an abundant tree, the true white fir (*Abies concolor*), whose massive gray trunks are unlike those of any other found in the forest. White fir (fig. 10) reaches a height of 200 feet under favorable conditions, and occasionally the trunks are 5 feet and more through. It seldom reaches this size except in the California Sierras. In southern Oregon half this diameter and 120 feet in height is nearer the average dimension for white fir. This tree may be recognized by its gray-furrowed bark, and by its dense conical crown, both when young and in old age.

White-fir needles are usually between 1 and 2 inches long, and on the lower branches they spread out from the sides of the slender twigs forming beautiful flat sprays. The cones of white fir occur in dense clusters, and as in all of the true firs, stand upright on the very top of the tree or at the tips of the upper branches. Except for those that are cut off by the squirrels, or are detached when immature by wind or other causes, they are never found on the ground, as the cone scales fall away separately, leaving the central spike standing

on the twigs. White fir matures its seed in one season, and in September the cones break up, sending their showers of seed and scales to the ground.

FIG. 10.—White fir (*Abies concolor*) 9 feet 3 inches in diameter; 115 feet high.

The botanical range of this tree is from southern Oregon to Lower California and east to the Rocky Mountains of Colorado, New Mexico, and Arizona. Nowhere is it valued to any extent for lumber as

its wood is soft and sappy and the trees are greatly damaged by heart rot.

White fir does not grow at high altitudes, going up to only about 6,000 feet in the Crater Lake National Park region. It is found mainly along the southern side, following fairly closely the range of sugar pine.

SHASTA RED FIR (ABIES MAGNIFICA SHASTENSIS).

The tree flora of the southern Cascades also includes several other species of the true firs that in a large part form the forest cover at the higher altitudes. One of these, the Shasta red fir (*Abies magnifica shastensis*), is a large tree, with a magnificent round, red-brown trunk, that nearly equals in size the largest white firs of the region. The rigid dark-green needles curl upward along the top sides of the twigs that stand out in stiff radiating sprays from the leaders and lateral limbs. The cones, which ripen in early fall, stand primly erect, are about 5 inches high, and have short, crinkled, yellow bracts projecting a short distance out from between the scales. When the cones have ripened their seed and commence breaking up in September their outer surface is a rich, brownish purple, while the inside of the scales and the seed wings are of various soft shades of rose and red-brown.

Shasta red fir (fig. 11) is comparatively abundant in the park, from 6,000 to 8,000 feet, being scattered with other species, mostly in cool, moist hollows and on shaded, moist slopes. On the Rogue River side Shasta red fir descends the mountain slopes and canyons to an altitude of about 4,000 feet, occasionally forming a considerable percentage of the stand of timber.

This tree grows naturally in the southern Cascades of Oregon and southward in the California Sierras. Throughout much of its range it is accompanied by a closely related species, the California red fir (*Abies magnifica*), that differs from it only in the structure of its cones. The red fir is a very important timber tree in the high Sierras of California.

SILVER FIR (ABIES AMABILIS).[1]

The silver fir (*Abies amabilis*), which is one of the most handsome of the Pacific coast firs, has, in the Crater Lake region, the extreme southern limit of its range (fig. 12). Occasional trees may be found in the forests on the higher mountain slopes, but it is rarely distinguished from the other species. Northward it follows the Cascades through Oregon and Washington, and it also is abundant in the coast region of Washington and British Columbia.

[1] This species is known as amabilis fir in Mount Rainier National Park.

The most distinctive character of this tree is the smooth gray bark that is not broken up into plates or ridges, except on the largest trunks. It is a fine handsome fir; that in the mountains of Washington often reaches a height of 150 feet or more.

FIG. 11.—Shasta red fir (*Abies magnifica shastensis*).

ALPINE FIR (ABIES LASIOCARPA).

In the higher portions of the park is found the alpine fir (*Abies lasiocarpa*), a small, graceful tree whose limby trunks rarerly exceed 80 or 90 feet in height (figs. 13 and 14). The crowns of these trees

are remarkably conical and slender, and are prolonged into tall, narrow spires, both when young and in old age. This spire-shaped crown is very distinctive, and by it this tree can be distinguished at once from all other species with which it is found. When growing in the open the crowns extend nearly to the ground, but in close stands the lower limbs finally die and become bent downward tightly against the small trunk. The bark of this fir is smooth, hard, and chalky white in color, and its thinness makes the trees very easily killed, even by light surface fires. The foliage of alpine fir

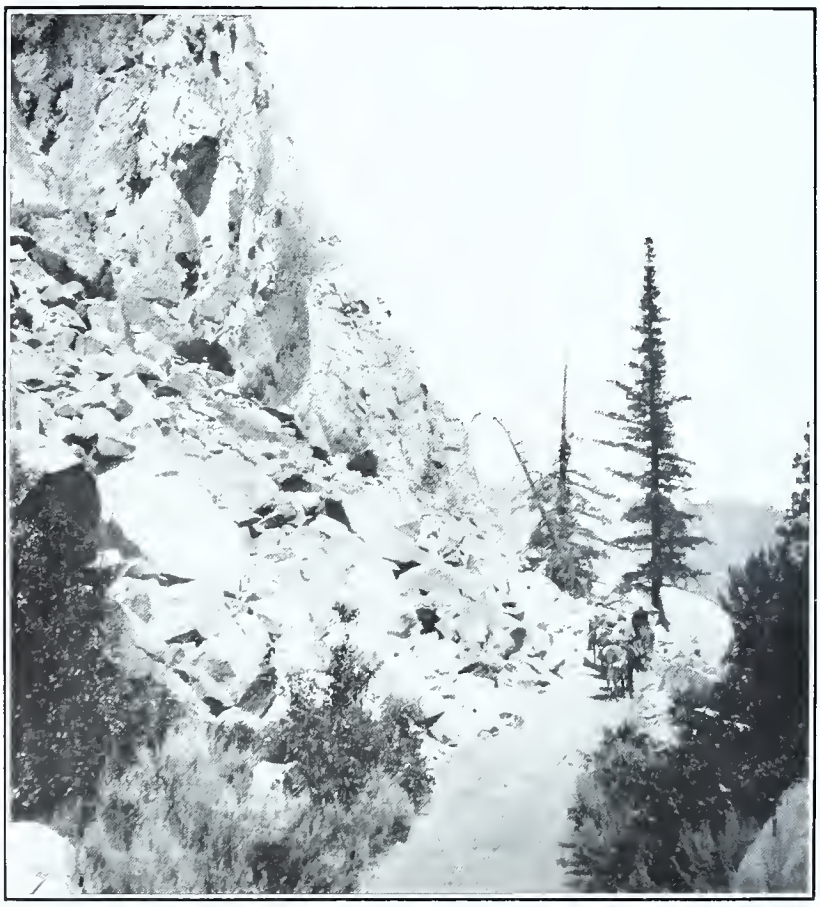

FIG. 12.—Silver fir (*Abies amabilis*).

is dark blue-green, and the small cones, which are produced abundantly every two or three years, are borne mostly on the upper portion of the slender crown.

It is mainly this fir that ornaments the slopes and ledges in Anna Creek Canyon, and which finds a precarious foothold on the steep and rocky inner walls of the crater of Mount Mazama. It is abundant throughout much of the park, from about 6,000 feet up to the local timber line that exists on several of the highest peaks, and on the outer slopes of Mount Mazama it forms, with mountain hem-

lock and western white pine, a considerable portion of the forest cover.

Alpine fir is widely distributed throughout much of the highest portions of the Cascade and Rocky Mountains from Alaska to

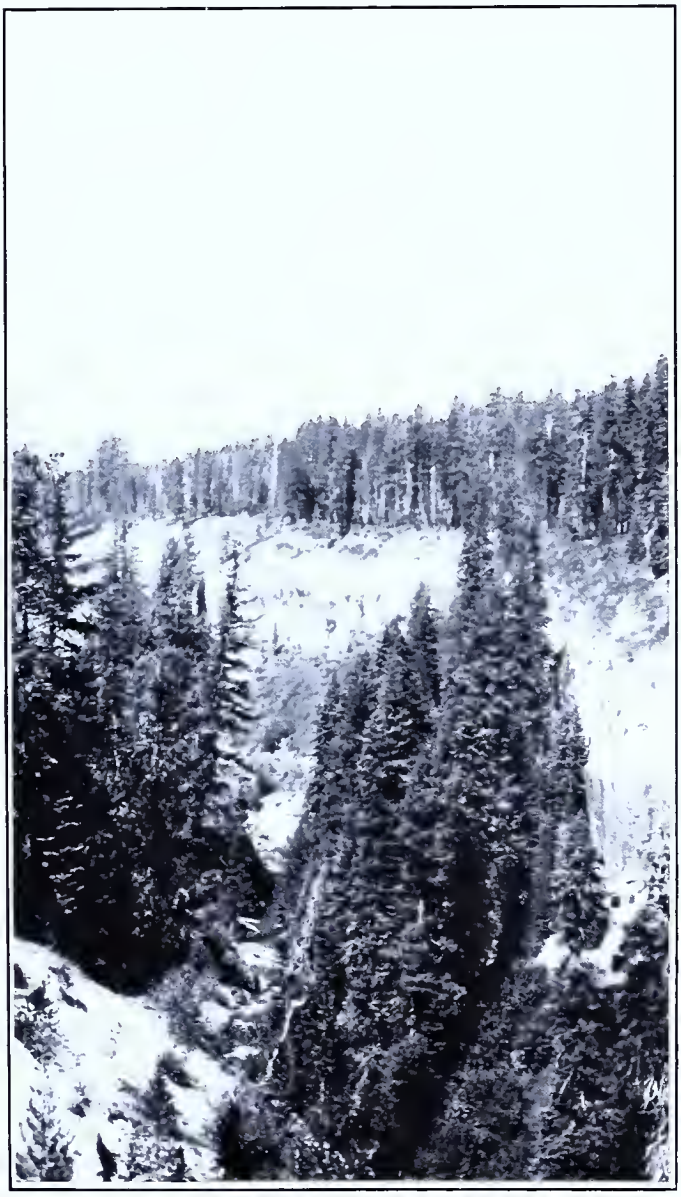

FIG. 13.—Within the crater of former Mount Mazama. This view from the surface of the lake shows the scattered groups of alpine fir and other conifers on the steep inner slopes.

Photograph by H. H. Barbur.

Arizona and New Mexico. It is essentially a tree of high altitudes, seeming to prefer those situations where the winds blow the strongest and the winter snows pile the deepest around its slender spires.

On account of its small size alpine fir is used little, except occasionally for miners' cabins in the highest mountains. The greatest value of this species is its power to form a partial forest cover in barren situations near timber line.

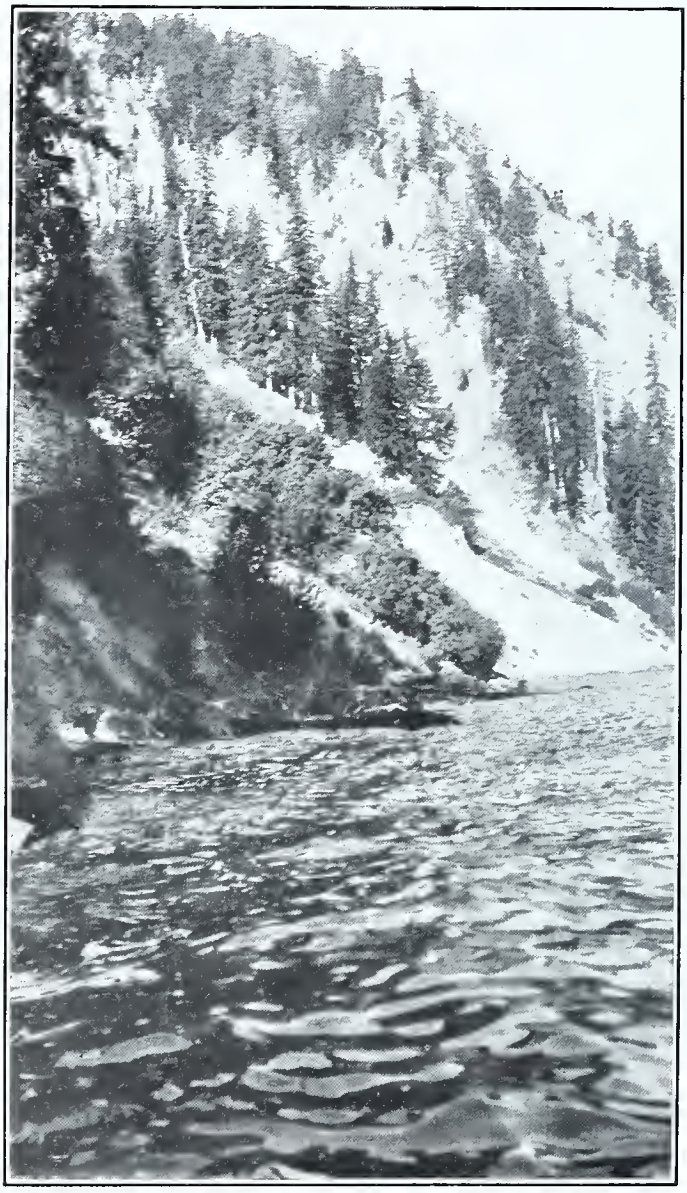

FIG. 14.—View of Anna Creek Canyon from the Fort Klamath-Crater Lake Road. The trees in the foreground are mainly alpine fir.

Photograph by H. H. Barbur.

WESTERN WHITE PINE (PINUS MONTICOLA).

Besides the yellow and sugar pine that have already been noted there will be found among the firs and hemlocks, well up in the park, another handsome pine, with a clear, rounded trunk and reddish-

brown bark, broken up into small square blocks. This is the western white pine (*Pinus monticola*), a very close relative of the famous white pine of the East. Western white pine (fig. 15) in heavy forests is a massive tree that has a straight, slightly tapering trunk, and usually a narrow, open crown. Its blue-green needles, like those of sugar pine, are found in clusters of five, and the slender cones, from 6 to 12 inches long, occur mainly on the tips of the pendulous branches.

FIG. 15.—Western white pine (*Pinus monticola*). Diameter, 24 inches; height, 50 feet.

This pine, as its name indicates, is a mountain-loving tree. It is scattered widely in the Cascades and Sierra Nevadas, and in northern Idaho and Montana forms immense forests of great value.

In the Crater Lake region it is most abundant at elevations slightly over 6,000 feet, but also extends down to about 5,000 feet on the western and 5,500 feet on the Klamath slopes. Especially fine white pines occur about one-half mile or so above the superintendent's lodge, along the road that winds from the head of Anna Creek, up

the outer slopes of Mount Mazama, to the crater rim. Here it can be recognized easily by its checkered bark, feathery crown, and pendant cones at the ends of the limbs.

ENGELMANN SPRUCE (PICEA ENGELMANNI).

The spruces are represented in the southern Cascades by one species. The Engelmann spruce (*Picea engelmanni*) is a small tree,

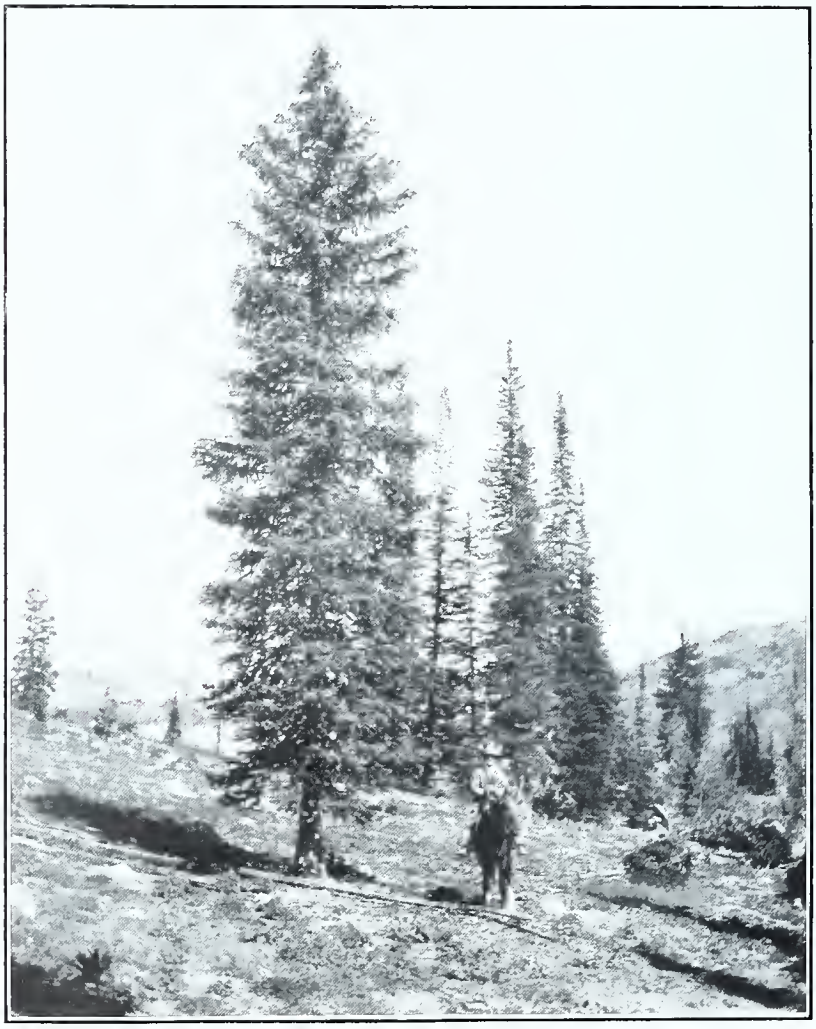

FIG. 16.—Engelmann spruce (*Picea engelmanni*).

usually about 70 feet high, and occasionally two or more feet through (fig. 16). It is a tree that requires a moist soil and low temperatures, and, therefore, is found mainly in a few favorable situations high in the mountains. In Anna Creek Canyon and along other water courses, where the stream beds are flanked by heavy timber, Engelmann spruce extends far down from its mountain habitat into the drier yellow-pine zone.

Ascending Anna Creek, the observer will note in the canyon among the firs and lodgepole pines the red-brown, scaly trunks and dense, pointed crowns of this spruce. The foliage, composed of sharp, stiff needles about 1 inch long, is dark blue-green, and extremely prickly to the touch. The cones are about 2 inches in length, with thin, crinkled, shiny brown scales, and are produced in abundance in the upper part of the crown. At higher elevations, up to 8,000 feet, the trees are more short and stunted, and taper rapidly from the ground.

Engelmann spruce is widely distributed throughout the Cascades and in the Rocky Mountains, from British Columbia south to New Mexico. In parts of its range it is very abundant, and commercial use is made of the light, soft, yellowish wood.

MOUNTAIN HEMLOCK (TSUGA MERTENSIANA).

Besides alpine fir, there are two other timber line species, the mountain hemlock and white-bark pine, that climb to the highest, most rocky and wind-swept slopes throughout the Crater Lake National Park.

Mountain hemlock (*Tsuga mertensiana*) usually is a short, stunted tree, with a heavy body whose crown reaches nearly to the ground (figs. 17 and 18). In the forest it produces a clean, straight trunk, and narrow, sharp pointed crown, but when standing alone on crests and ridges, the trees are bent down and distorted, and the long lower limbs spread far out over the ground. The leaders or terminal shoots always droop gracefully, and in the fall the entire slender tops of the trees bend under the weight of their heavy load of greenish-purple cones. These cones, when mature, are about 2 inches long, and their smooth scales open in late fall, liberating the seeds. The ground beneath mountain hemlock trees always is littered with many fallen cones, whose scales then become widely spread and deflexed. The color of the feathery foliage is blue-green, and the reddish-brown bark always is deeply furrowed and roughened.

Mountain hemlock grows naturally in the high mountains, from Alaska to California, also in the northern portion of the Rocky Mountains. On account of its usual small size and high range it is not used commercially except occasionally for mine timbers.

Mountain hemlock is very abundant around the outer slopes of Mount Mazama for several miles below the crater rim. The road from Anna Spring to the lake passes through a heavy, nearly pure stand of this species, in which the trunks crowd each other for floor space beneath the shade of their heavy crowns.

WHITE-BARK PINE (PINUS ALBICAULIS).

The white-bark pine (*Pinus albicaulis*) is the best mountaineer in the region (fig. 19). On the high rocky ridges and rims, it is a short

FIG. 17.—Mountain hemlock (*Tsuga mertensiana*).

Photograph by George O. Ceasar.

stunted tree, gnarled and rounded by the buffeting wind, with its limbs bowed and spread over the ground by the winter snows. Usually it is not over 20 feet high and 20 inches in diameter, and its

stout trunk, limbs, and large twigs, clothed with white bark, form a pleasing contrast with the yellow-green foliage.

FIG. 18.—The Watchman. This sparse forest cover is typical of the higher altitudes in Crater Lake National Park. The timber is mostly mountain hemlock (*Tsuga mertensiana*).

The needles of white-bark pine are in clusters of five, and are thickly massed near the ends of the branches. The cones are small.

about 2½ inches long, with thick heavy scales that are a light russet brown when mature. Few whole cones are found on or beneath the tree, as the squirrels and chipmunks know full well the value of their meaty seeds.

White-bark pine is common on the rim of Crater Lake, on Wizard Island, and on many of the higher surrounding peaks. Throughout

FIG. 19.—White-bark pine (*Pinus albicaulis*).

Photograph by A. H. Denman.

the range of this tree in the Cascades, Sierras, and northern Rockies, it rarely descends below an elevation of 6,000 feet. Nowhere is it valued for commercial purposes, as its trunks are gnarled and knotty, and it nearly always is found in inaccessible situations.

INCENSE CEDAR (LIBOCEDRUS DECURRENS).

There are a number of other trees in the southern Cascades which belong more properly to the lower forest zones of both the east and

west slopes, but which occasionally reach up into the edges of the park. On the east side is the incense cedar (*Libocedrus decurrens*), a large tree with light cinnamon-brown fibrous bark and a trunk that flares widely at the ground (fig. 20). Its yellow-green foliage always is massed in a beautiful conical crown. It is common west of Upper Klamath Lake, and occurs sparingly among the yellow pine, sugar pines, and firs, around the southern edge of the park.

FIG. 20.—Incense cedar (*Libocedrus decurrens*).

WESTERN HEMLOCK (TSUGA HETEROPHYLLA).

On the Rogue River side will be found western hemlock (*Tsuga heterophylla*) in canyons, along streams, and on shaded north slopes (fig. 21). It is a rather large tree, with smooth, round, red-brown trunks, and light open crowns of delicate, yellow-green foliage. Its cones are much smaller but are similar in shape to those of mountain hemlock. It is a fairly abundant tree at middle altitudes on the western slopes of the Cascades, and in the Coast Mountains forms a considerable part of the heavy forests of Oregon, Washington, and British Columbia.

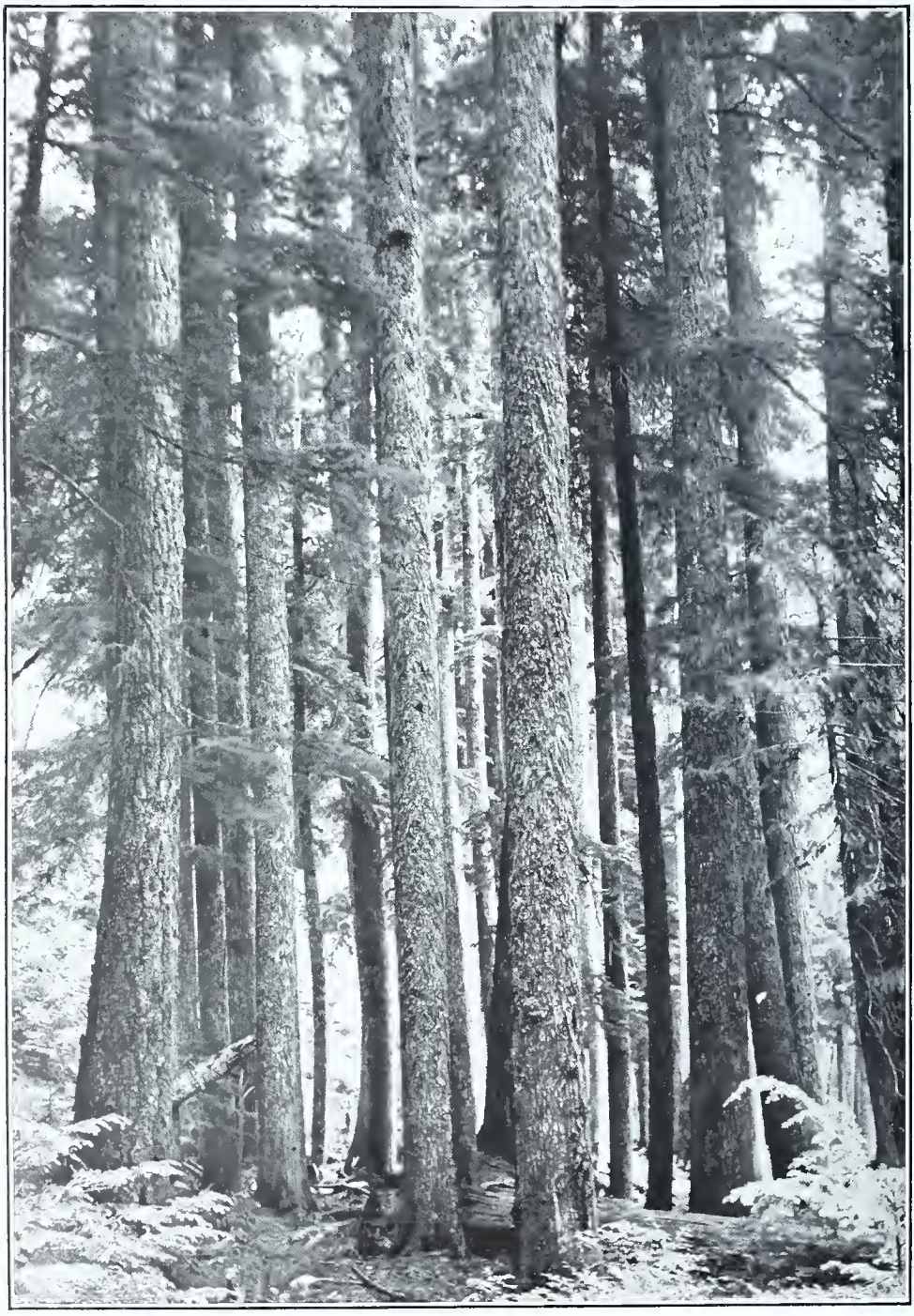

FIG. 21.—Forest composed largely of western hemlock (*Tsuga heterophylla*). The tree on the extreme left is a Douglas fir.

Photograph by A. H. Barnes.

WESTERN RED CEDAR (THUJA PLICATA).[1]

On the west slope the careful observer may also note the western red cedar (*Thuja plicata*), a rapidly tapering tree, with cinnamon-brown bark, upturned branches, and remarkably long, flat sprays of

FIG. 22.—Western red cedar (*Thuja plicata*).

foliage (fig. 22). The cones of western red cedar are small, about half an inch long, and are composed of 8 to 10 oval brown scales. They differ from the cones of incense cedar, whose elongated cone scales are 6 in number. Both cedars, instead of shedding their

[1] This species is known as arbor vitæ in Glacier National Park.

short, scalelike needles singly, lose many short lateral branchlets each year. Western red cedar is one of the important timber trees of the Northwest, occurring in the Coast Range, Cascade, and Rocky Mountains. From its light, durable, red wood is manufactured prac-

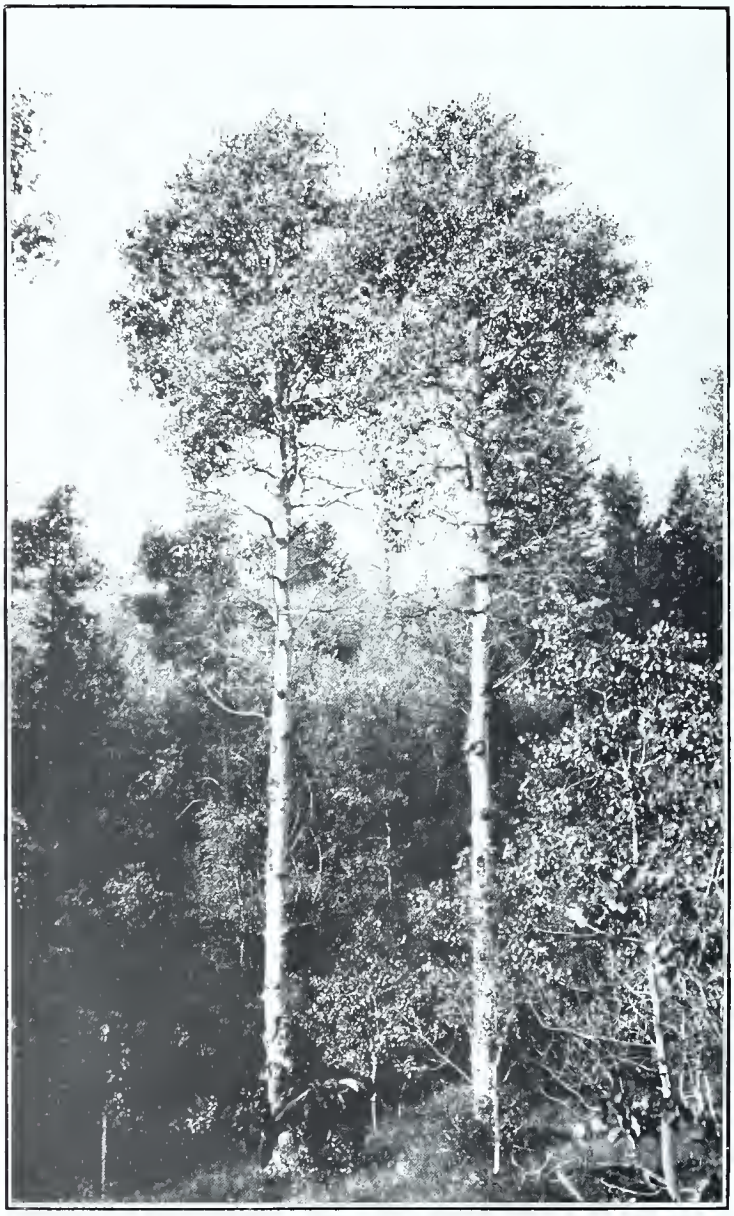

FIG. 23.—Aspen (*Populus tremuloides*).

tically all of the shingles produced in Oregon, Washington, and British Columbia.

SHRUBS AND DECIDUOUS TREES.

Beside the 12 to 15 cone-bearing trees that occur in the Crater Lake National Park, the beauty of its forests is further enhanced

by several broadleaf species, and a wealth of shrubs and undergrowth round their feet.

Underneath the pines and firs on the lower slopes of the east side the dry pumice soil is covered with chinquapin and ceanothus, the former a wiry, compact shrub with pointed leaves, golden and powdery beneath, and prickly burs much like those of chestnut. The ceanothus or buckbrush spreads out in large clumps and has shining, sticky, evergreen leaves that are pleasantly fragrant. Scattered through the forest are the slender crooked stems of the aspen (*Popu-*

FIG. 24.—Black cottonwood (*Populus trichocarpa*).

lus tremuloides), with white bark and small heart-shaped leaves that never cease trembling in the breezes that sway the tops of the pines overhead. (Fig. 23.) In the stream bottoms and around springs are mingled willows, alders, and other shrubs, forming in the canyon of Anna Creek and elsewhere masses of light green in spring and summer. Over these the black cottonwood (*Populus trichocarpa*) lifts its massive trunks and wide-open heads, mingling among the darker green spires of the fir and spruces. (Figs. 24 and 25.)

Higher up in the park the shrubs are smaller, mostly huckleberry, manzanita, and dwarfed ceanothus, filling the openings and spreading beneath the lodgepole pine. Here the young forest growth is abundant—fine sharp-pointed little firs, lodgepole in dense thickets, and mountain hemlocks with their slender drooping tips and twigs.

In the region of heavy snows on the long outer slopes of Mount Mazama the hemlock, white pine, and firs form close, dark forests, beneath whose shade few shrubs can exist. Here a small dwarf huckleberry (*Vaccinium microphyllum*), currants, and one or two others form a broken carpet. The dry, open pumice slopes just

FIG. 25.—Black cottonwood (*Populus trichocarpa*).

below the edge of the crater support few shrubs among the scattered hemlocks and white-bark pines.

On the west side of the Cascade Divide the forests are more dense, with a greater wealth of undergrowth and shrubs. Willows, alders, and dogwoods fringe the streams and marshy meadows in great profusion. Here the Oregon yew (*Taxus brevifolia*) may be found, a small shrubby tree, related to the cedars and firs, with dark, glossy green needles, and in the late summer with sweet coral-red berries. Its wood is dark red and almost as durable as the bowlders in the streams along which it grows. Over the drier ridges and points the huckleberry bushes are laden with dark purple fruit in early autumn. In this region the Klamath Indians assemble and gather great quantities of the sweet berries for winter's use.

The forests of Crater Lake National Park have an abundance of wild life, but there are no dangerous animals that need be feared during the summer season. Squirrels, spermophiles, rabbits, and porcupines are abundant in the timber and brush-covered areas, and deer, bears, and other large animals occasionally are seen. Numerous birds find an ideal home in its forests and along its streams, among them grouse of several kinds, grosbeaks, woodpeckers, and a few such as the Oregon jay and the Clarke nutcracker, common only in the higher mountain regions.

The traveler that makes only a fleeting trip to the park, sees the lake but once, and then passes on will overlook much of the best that the region can show. It is better to remain longer within the borders, to camp beneath its hemlocks and firs, to explore its peaks and forests, and look often and long upon its lake, whose blue waters and wonderful tree and cliff setting leave memories than can never be lost.

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